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UCRL-TR-201986

Design Parameters for CVD Shrapnel Tiles

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CVD-2B Shrapnel Tiles

- **Purpose**

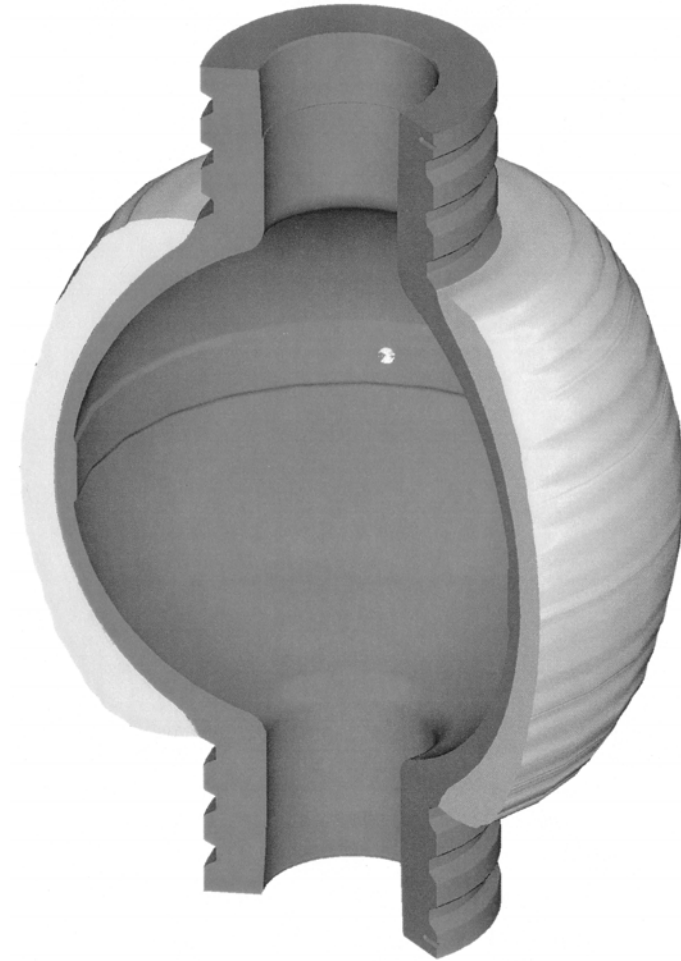
- The purpose of the ceramic tiles will be to cover the inside wall of a spherical firing vessel and thus protect the inner liner from shrapnel

- **Design Constraints**

- Select appropriate geometric shape, material and manufacturing processes for shrapnel mitigating ceramic tiles
- Tiles must fit thru port openings
- Tiles must conform to inner spherical or elliptical radius
- Minimize the number of different tile sizes
- Minimize total number of tiles
- Minimize cost
- Tiles must be assembled from the inside

- **Vessel Dimensions**

CVD-2B Vessel	
Port Openings	11.500" Diameter
Inner Spherical Liner	18.637" Radius
Liner Material	Alum 2219-T6



CVD-2B Shrapnel Tiles

- **Design Option #1**
 - 5 rows of tiles
 - 3 sizes of tiles
 - 12x 30° apart for each row
 - Total tiles = 60
 - Equatorial tile spans weld joint at vessel waist
 - Tiles ‘stack’ on horizontal edges
 - Tiles inter-lock radially with beveled edges
 - Design #1 assumes friction stir-weld step is machined off



CVD-2B Shrapnel Tiles

- **Design Questions**

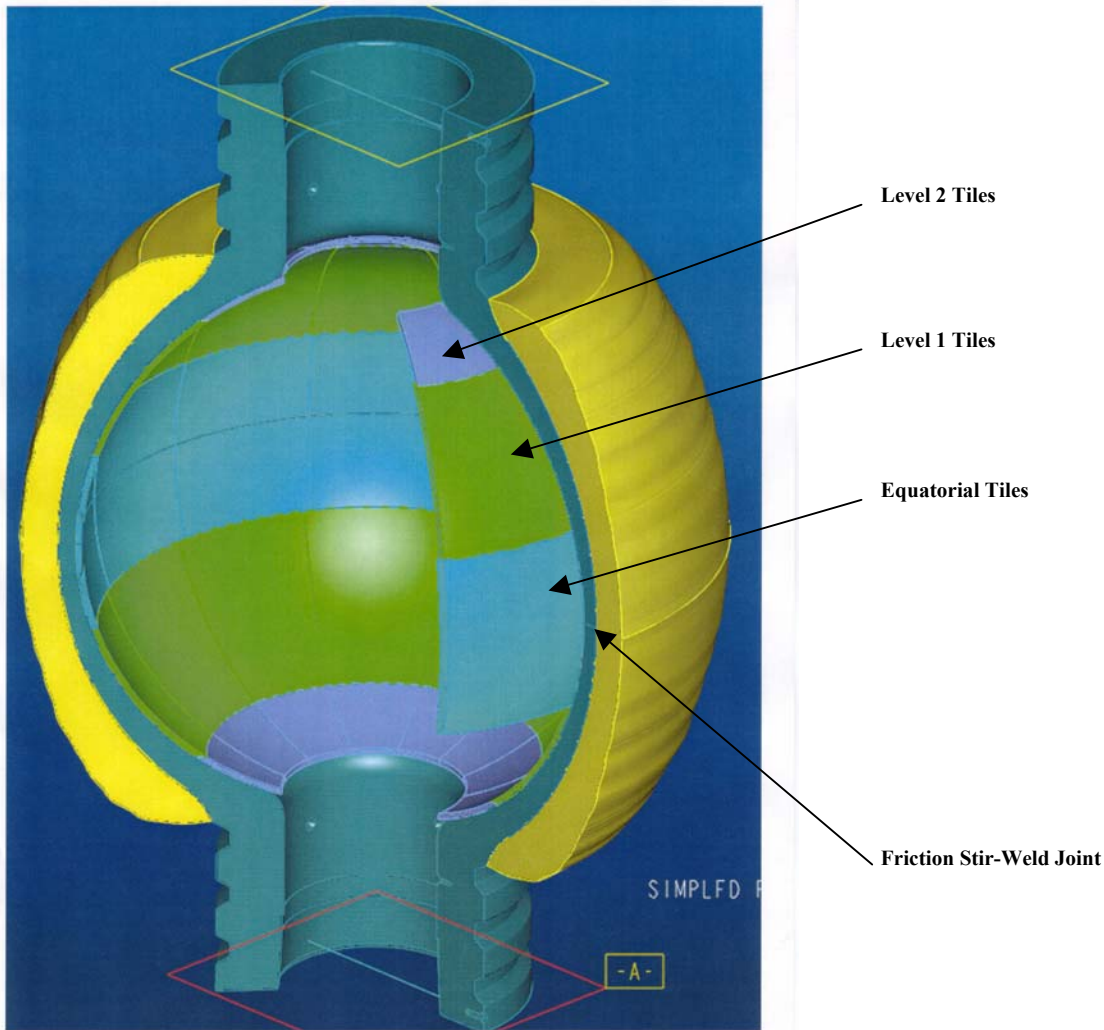
1. Can the tiles be manufactured from these five material choices: B_4C , SiC , Al_2O_3 , TiB_2 and Pyrex
2. Can the tiles be easily manufactured into the shapes shown on the detail drawings
3. For the ceramic tiles, which Pressing Process would be used: Dry, Cold Isostatic, Hot, Hot Isostatic
4. What type of mold design would be required, ie, Graphite or Steel molds; design limits on molds
5. Expected % of shrinkage after Firing process
6. What is high cost driver in the manufacturing process: Shape of tile, Thickness to Length ratio, Tolerances, Final Machining or Post Surface Finishing
7. What else...?



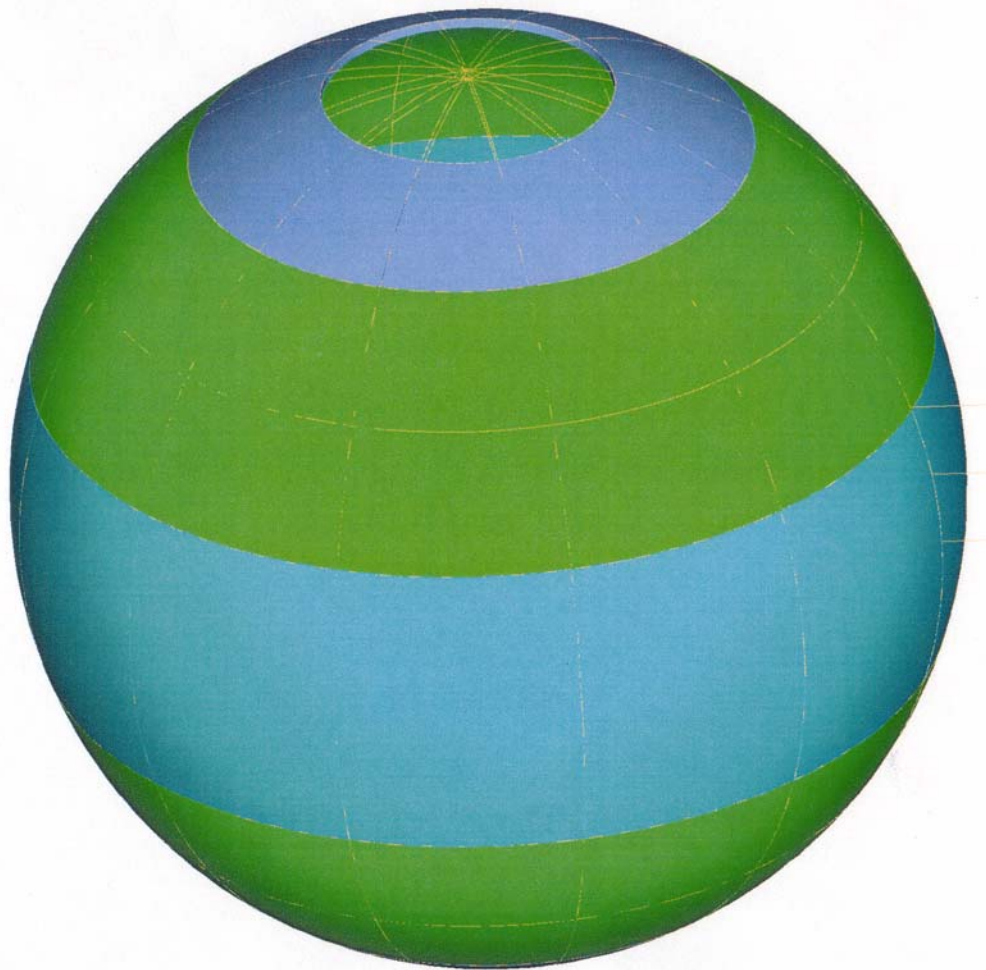
CVD-2B Shrapnel Tiles

Design Option #1

Shrapnel tiles bonded inside Firing Vessel



CVD-2B Shrapnel Tiles



Design Option #1

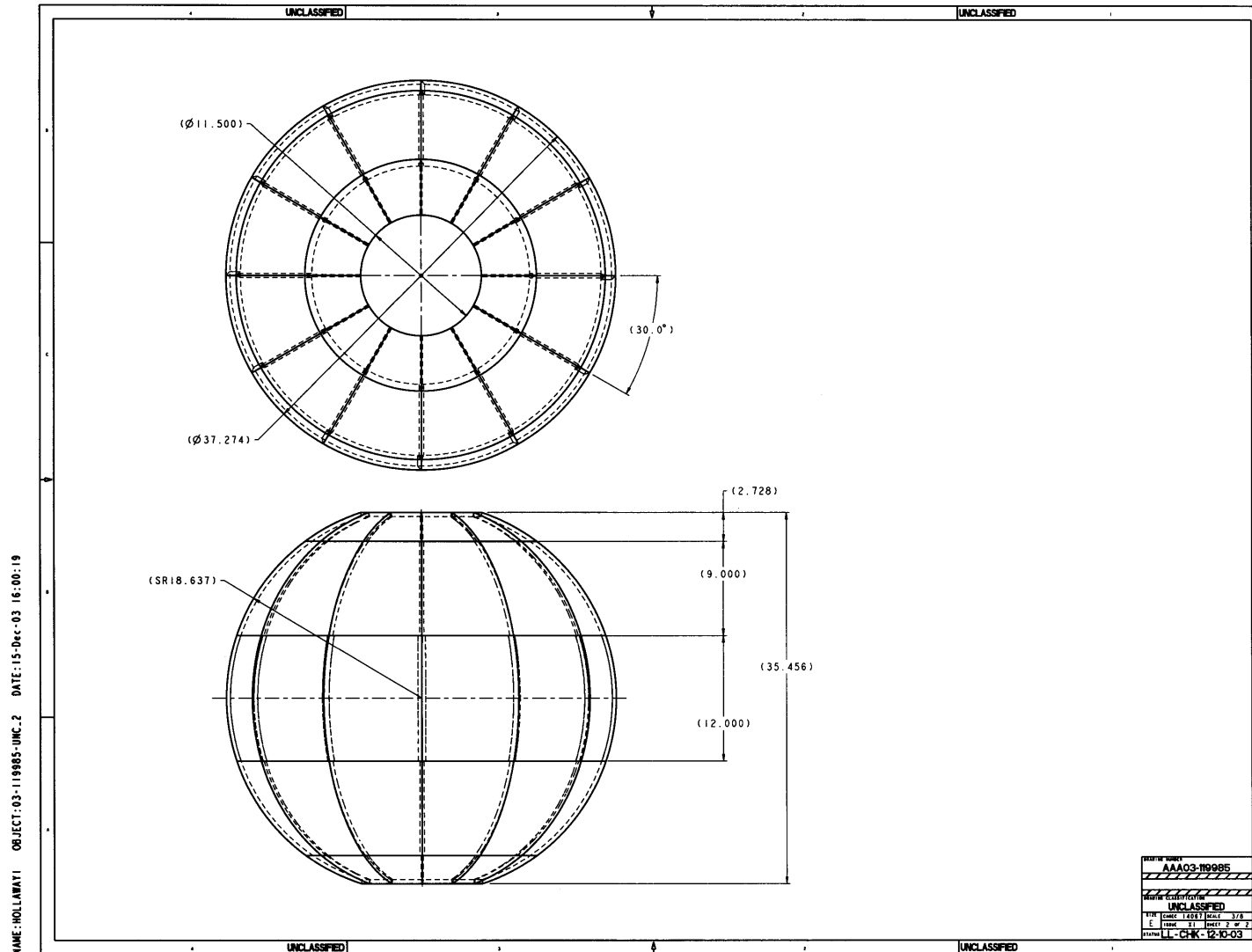
Tile assembly without Vessel



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CVD-2B Shrapnel Tiles



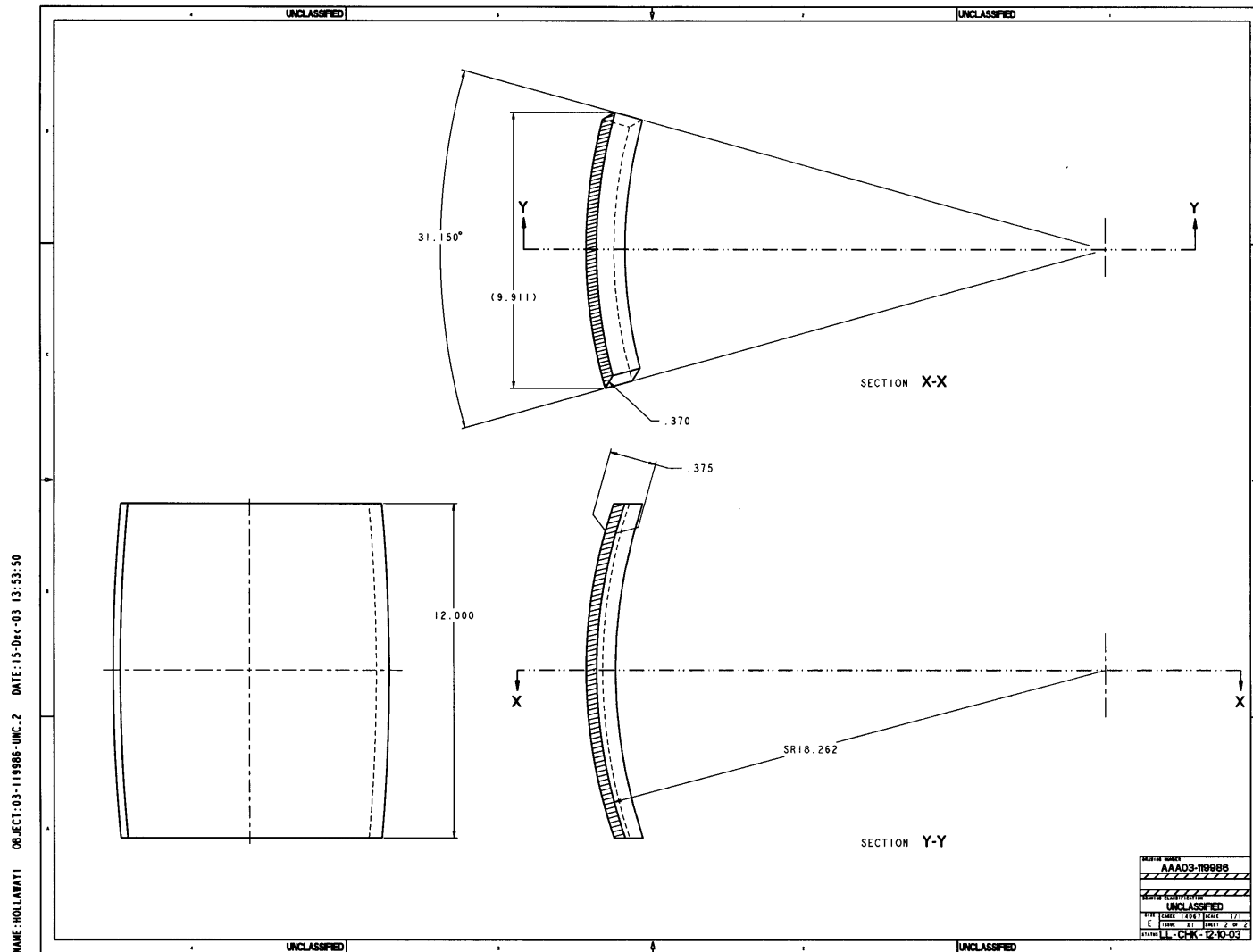
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CVD-2B Shrapnel Tiles



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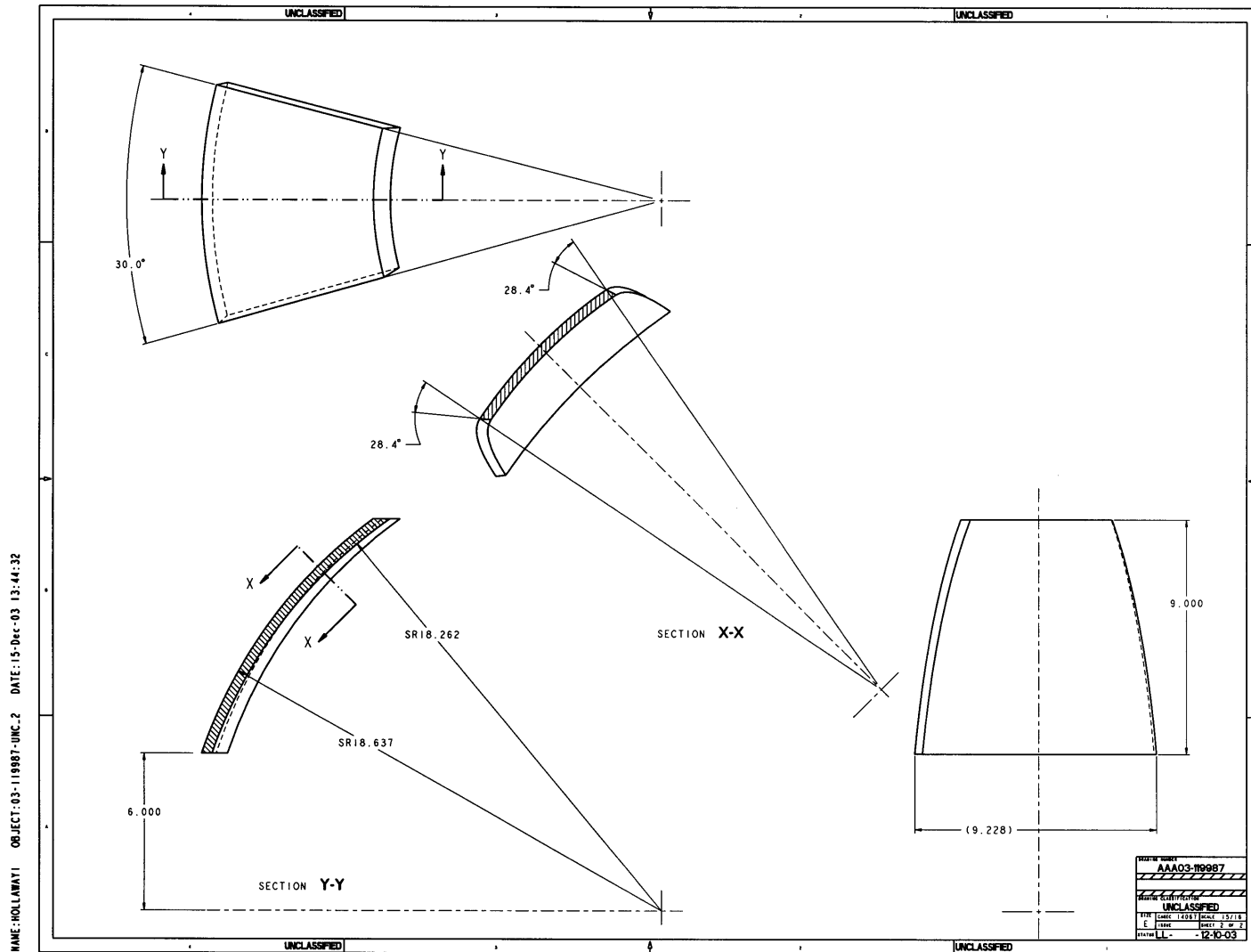
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CVD-2B Shrapnel Tiles



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CVD-2B Shrapnel Tiles

UNCLASSIFIED

UNLESS OTHERWISE SPECIFIED:

1. ALL DIMENSIONS ARE IN INCHES.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. SURFACE TEXTURE PER ANSI B46.1-1985. SURFACE TEXTURE SYMBOLS PER ANSI Y14.36-1978.
4. FINISH: 125 MICROINCHES ALL OVER.
5. EDGES ARE GREAT CIRCLES.

6. PART CREATED FROM THE FOLLOWING MOLD COMPONENTS:
MALE MOLD, UPPER AAA03-XXXXXX
FEMALE MOLD, LOWER AAA03-XXXXXX

7. ESTIMATED VOLUME = 9.2 INCH³

8. MANUFACTURE PER THE FOLLOWING PROCEDURE:
A.
B.
C.

9. GLASS SHALL BE WRAPPED IN TISSUE, OVERWRAPPED WITH CUSHIONING MATERIAL AND SECURED WITH TAPE.

BAG AND TAG WITH PART NUMBER.

ISO VIEW 1
INNER SURFACE
SCALE 1/1

ISO VIEW 2
OUTER SURFACE
SCALE 1/1

PRELIMINARY
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DRAWING: 03-120135-UNC, MODEL: 03-120135-UNC, TYPE: PART

UNCLASSIFIED

DATE: 15-Dec-03 16:07:17

OBJECT: 03-120135-UNC.1

NAME: HOLLAWAY

REVISIONS

PART NUMBER	REV	DATE	DESCRIPTION	DATE
-	-	-	-	-

HAND: R. HOLLAWAY
DRAWN: R. HOLLAWAY
CHECKED: J. PASTERNAK
APPROVED: J. PASTERNAK
ORIGINAL ISSUE

12-15-03

NO SCALE

PART/CONTROL NO.

DESCRIPTION/MATERIAL

PROPERTY

VELOCITY

ITEM

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CVD-2B
0.555 SCALE
SHRPAHEL TILE, LEVEL 2 (U)

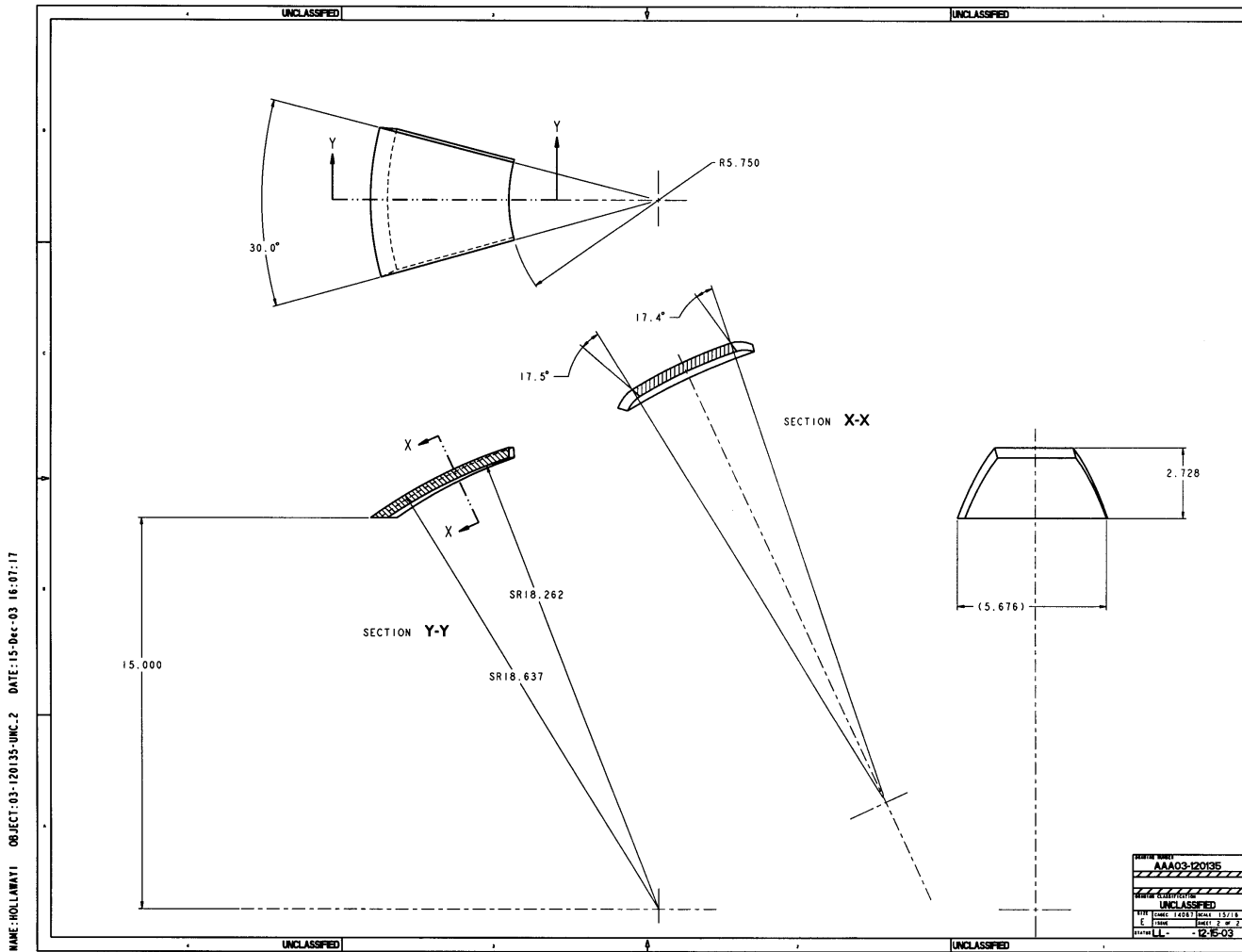
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